REMARKS

Claims 47-72 are pending in this application. Support for the amendments to the claims can be found in paragraphs [0075] and [0082] of the original specification.

Rejection under 35 U.S.C. §103

Claims 47-72 have been rejected under 35 U.S.C. § 103 as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Shibata (U.S. Patent No. 6,461,890) and Kaneda et al. (U.S. Patent No. 6,223,429) for the reasons described in pages 2-21. Applicant respectfully traverses this rejection.

The Office argues that AAPA describes the invention substantially as claimed. While the Office recognizes that the AAPA does not teach certain of the claim limitations, it argues that such limitations would have been obvious in light of Shibata, Kaneda et al., and/or the common knowledge in the art.

1. Stud Bump

The Office argues that AAPA discloses a stud bump (35) located on a portion of the RDL pattern not covered by the insulating layer. Applicant respectfully disagrees with this interpretation of the AAPA. The AAPA explicitly describes that in Figure 1, number 35 is used to designate a solder bump. *See paragraph [0010], line 10.*

The Office has the burden of showing where each and every limitation in the claims is taught or suggested by the prior art. The claims clearly recite a stud bump (and not a solder

bump). And it is clear, based on the disclosure of the AAPA, that the Office has not shown that the AAPA teaches a stud bump.

Thus, the Office must show that the claim limitation of a stud bump would have been obvious to the skilled artisan in light of the explicit disclosure of a solder bump 35 in the AAPA. Along those lines, the Office argues that it is not clear how a solder bump is different than a stud bump in general. But such a statement fails to show why the skilled artisan—in light of the AAPA—would have used a stud bump instead of the explicitly disclosed solder bump 35. Is the Office arguing that a solder bump and a stud bump are equivalents?

In fact, there are many differences between solder bumps and stud bumps. To begin with, solder bumps typically require a reflow process whereas stud bumps do not. Also, stud bump pitches of 50 mm or less can be achieved which allows a higher density interconnection than conventional solder bumping. *See Appendix A.*

2. Leadframe With Bond Pad

The Office recognizes that the AAPA fails to teach a leadframe substrate. The Office contends that Shibata contains a leadframe substrate and that it would have been obvious to use the leadframe taught by Shiabta et al. in the AAPA because the use of conventional materials to perform their known function is obvious.

The AAPA describes that substrate 5 is a silicon substrate. But why would the skilled artisan replace a silicon substrate (which is a semi-conductive material) with the leadframe substrate (which is typically made of a metal like Cu and therefore conductive)? Merely because a leadframe can be used gives little reason to substitute it for a silicon substrate. And the Office must show that the leadframe substrate would perform the same function as the Si substrate.

Indeed, some of the rejected claims recite that the substrate contains a chip pad thereon. If the silicon substrate 5 of the AAPA were replaced with the leadframe substrate 60 of Shibata, that would mean that the chip pad 40 of the AAPA would be located on a leadframe substrate. Such a combination would make little sense to the skilled artisan.

3. Conductive Particles

The Office recognizes that the combination of the AAPA and Shibata fails to teach that the conductive particles comprise metal with an insulating layer. The Office argues that such a feature would have been obvious in light of column 6, lines 35+ of Kaneda et al. In essence, the Office argues that the skilled artisan would have been motivated to modify the device of Shibata by replacing its conductive particles 32 with the conductive particles 2-6 of Kaneda et al. because the Kaneda et al. conductive particles 2-6 would have improved the insulating properties in the lateral direction.

Applicant respectfully continues to disagree for the reasons of record. As well, Applicant disagrees because using the conductive particles of Kaneda et al. would prevent the correct operation of the Shibata et al. Kaneda et al. describe that the conductive particles 2-6 comprise metal (i.e., Ni, Ag, Au, or Cu) that may contain a thin organic insulating film. *See column 3, line 31-37*. Substituting these particles 2-6 for the conductive particle 32 of Shibata et al. would then place a thin organic insulating film on the conductive particles 32.

But Shibata et al. describe that the purpose of the conductive particles 32 is to provide a connecting structure with the terminals 11 and 21 by alloy bonding with them. *See column 3, lines 12-16*. Thus, the metal in the terminals 11 and 21 become bonded to the metal of the conductive particles 32 by creating an alloy. But placing a thin organic insulating film on the

conductive particle 32 would diminish or eliminate the ability to create such an alloy bond, thereby changing the principle operation of Shibata and failing to show a *prima facie* case of obviousness. *See M.P.E.P. § 2143.01(vi).*

4. Non-Polymeric Insulating Layer

The Office notes that the AAPA is silent as to the material used as the insulating layer that covers the RDL, but that it would have been obvious to use a non-polymeric insulating material (such as silicon dioxide) since it is a common material used as an insulating layer. The Office notes that the use of conventional materials to perform their known function is obvious.

The problem with the Office's argument is that the AAPA is not silent as to the material used as the insulating layer that covers the RLD pattern. In paragraph [0013], the AAPA explicitly discloses that the two insulating layers (15 and 25 in Figure 1) are made of polymeric materials, such as polyimide and benzocyclobutene.

Thus, the burden on the Office is to show that the skilled artisan would have been motivated the skilled artisan to replace the AAPA's polymeric insulating layers with non-polymeric insulating layers. The Office's only motivation has been that non-polymeric insulating layers are commonly known in the art. But even though they are commonly known, the Office must show what would have motivated the skilled artisan to make such a change, as well as that replacing the polymeric layers with non-polymeric layers would have yielded predictable results. *See M.P.E.P. § 2143.* But the Office has not met this burden.

5. Pd Coated Cu Wire

The Office recognizes that the combination of AAPA, Shibata, and Kaneda et al. fail to teach that the stud bump is formed by wire bonding a Pd coated Cu wire to the RDL pattern using a capillary to provide the stud bump with a coined shape. The Office agrees that such a process condition would require Pd to be present in the stud bump. The Office notes that Pd-coated wires are commonly known and used in the industry and that the used of conventional materials to perform their known functions is obvious.

Again, the burden on the Office is to show that the skilled artisan would have been motivated to make the proposed modification. The Office's only motivation has been that Pd coated wires are commonly known and used in the art. But even though they are commonly known, the Office must show that adding the Pd coating would have yielded predictable results. *See M.P.E.P. § 2143*. But the Office has not met this burden.

Further, why would the skilled artisan use a Pd coating on the stud bumps when Shibata et al. already contain a coating that is not Pd? The Office's position is that Shibata teach stud bumps 11. These terminals 11 are obtained by plating aluminum pads with gold. *See column 7, lines 46-47*. According to the Office, it would have been obvious to replace the gold plating with copper.[1] In such a configuration, the terminals 11 would therefore comprise aluminum pads with a Cu plating. What possible reason would the skilled artisan have to add another Pd coating to the Cu plating?

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[1] Applicant continues to disagree with this substitution for the reasons of record. But for the sake of the arguments presented in this section, Applicant will not repeat those disagreements with this substitution.

6. Substrate Comprising High-Glass Transition Material

Current claim 72 contains the limitation that the substrate comprises a high glass transition material. But the Office has not yet shown how such a substrate would have been obvious to the skilled artisan in light of the cited references.

7. Under Bump Metal

The Office recognizes that AAPA fails to describe the absence of an under bump metal (UBM) under the stud bump. The Office argues that eliminating the UBM in the Figure 1 device of AAPA would have been obvious because it has been held that omission of an element and its function is obvious if the function of the element is not required, citing M.P.E.P. § 2144.04(II). The Office argues that the AAPA device would work without the UBM and it would be obvious to remove it in order to reduce the cost.

But that is not what this legal doctrine stands for, nor is that what this section of the MPEP states. This section contains the statement that "omission of an element and its function is obvious if the function of the element is not desired." *M.P.E.P. § 2144.04(II) (emphasis added).* The focus is not on what is (or is not) "required." Rather, the focus is on what is (or is not) "desired." And the Office has stated on the record in the parent application, that the UBM would have been desired by the skilled artisan. Specifically, the Office admitted that the UBM makes the electrical pad "operate better." *See Office Action of November 22, 2006, page 2.* In other words, if the UBM makes the electrical pad operate better, it stands to reason that such a component would be desirable to be included.

In response to this argument, the Examiner cites to the decision of *Ex Parte Wu* which this section of the MPEP states as holding that it would have been obvious to omit the polybasic

salts described by the primary reference where the function attributed to such salt is not desired or required. *M.P.E.P. § 2144.04(II).* The Office accordingly takes the position that obviousness in omitting an element must consider both what is desired and what is required.

To begin with, the Office's position ignores every other statement in M.P.E.P. § 2144.04(II). In every other instance, including the title, the focus is on what is "desired." The one and only mention of "required" in this section of the MPEP is located in the summary of this court decision. In fact, turning to this decision itself, we see that the focus in the Board of Appeals remains on what is "desired." Discussing the prior art reference, Murdock, the Board explained the reasoning for its decision that omission of the salts would have been obvious.

> Murdock teaches that these salts are *beneficial* when the composition is employed in contact with fresh water. Omission of the salt component in preparing compositions to be used to provide corrosion resistance to metal in environments which do not encounter fresh water would have been obvious.

Ex Parte Wu, 10 U.S.P.Q. 2031 (BPAI 1989) (emphasis added). Thus, the Board's decision focused on what is "desired" and not what is required. And this is what the Office needs to show in the present rejection to show a *prima facie* case of obviousness.

Further, the inclusion of a component that makes a device operate better would seem to be accepted wisdom in any technology, and proceeding contrary to accepted wisdom in the art is evidence of non-obviousness. *See M.P.E.P. § 2145 X(D)(III); see also, In re Hedges, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986).*

8. Absence of Chip Pad

Claim 1 currently recites a substrate not containing a chip pad. The AAPA describes that the substrate 5 has chip pad 40 thereon. But the Office has not yet shown that such a limitation would have been obvious in light of the cited prior art.

9. Conclusion

Thus, the Office has not substantiated a *prima facie* case of obviousness of the rejected claims over the proposed combination of references. Accordingly, Applicants respectfully request withdrawal of this ground of rejection.

CONCLUSION

For the above reasons, as well as those of record, Applicant respectfully requests withdrawal of the pending ground of rejection and allowance of the pending claims.

If there is any fee due in connection with the filing of this Amendment, including a fee for any extension of time not accounted for above, please charge the fee to our Deposit Account No. 50-0843.

Respectfully Submitted,

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